IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Martin Kaiser et al.
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Examiner : Chelcie L. Daye
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Title : DATA ORGANIZATION FOR DATABASE OPTIMIZATION

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AMENDMENT

In response to the Office Action dated January 18, 2006, please amend the above-identified application as follows:

AMENDMENTS TO THE CLAIMS are reflected in the listing of claims beginning on page 2 of this paper.

REMARKS begin on page 6 of this paper.

AMENDMENTS TO THE CLAIMS:

Please amend claims 1, 7, 11, 17 and 20, as shown below. This listing of claims replaces all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method comprising:

storing data objects as nodes in a directed graph; and

storing path information for a first object corresponding to a first node, where the path information comprises a sequence of nodes ~~provides relational information about a direct path~~ through the directed graph between the first node and a second node, where the second node is separated from the first node in the sequence of nodes ~~along the direct path~~ by at least a third node.

2. (Original) The method of claim 1 further comprising:

accepting a query regarding the first node;

locating the first object; and

accessing the path information to respond to the query.

3. (Original) The method of claim 1 wherein storing data objects comprises:

storing each data object in a first column of a data table; and

storing a relation of the first data object to a consecutive data object in a second field of the data table, where the consecutive data object is connected to the first data object in the directed graph by a single edge.

4. (Original) The method of claim 3 wherein storing path information comprises storing the path information in a third field of the data table.

5. (Original) The method of claim 1 wherein storing path information comprises storing a data string as the path information, where the data string includes at least the second node and the third node.

6. (Original) The method of claim 5 comprising comparing the data string to a query regarding the first node, in order to respond to the query.

7. (Currently Amended) The method of claim 5 wherein storing the data string comprises:

determining a first sequence of nodes ~~direct path~~ through the directed graph of which the first node is a part;

determining a first data string based on the first sequence of nodes ~~direct path~~;

determining a second sequence of nodes ~~direct path~~ through the directed graph of which the first node is a part;

determining a second data string based on the second sequence of nodes ~~direct path~~; and

concatenating the first data string and the second data string for storing as the path information.

8. (Original) The method of claim 1 wherein storing path information comprises transforming the relational information into a coded value.

9. (Original) The method of claim 1 wherein the directed graph includes a hierarchical, multi-leveled data structure.

10. (Original) The method of claim 1 wherein storing path information comprises updating the path information to reflect changes in the directed graph.

11. (Currently Amended) An apparatus comprising a storage medium having instructions stored thereon, the instructions ~~including~~ comprising:

a first code segment for storing data objects within a table;

a second code segment for storing a relation of a first data object to a second data object in the table, where the first data object and the second data object correspond to consecutive nodes on a directed graph; and

a third code segment for storing path information associated with the first data object in the table, where the path information comprises a sequence of nodes ~~describes a path~~ within the directed graph that is between the first node, the second node, and a third node.

12. (Original) The apparatus of claim 11 further comprising:

a fourth code segment for accepting a query about the first node and a possible relation of the first node to another node within the directed graph; and

a fifth code segment for responding to the query based on the path information.

13. (Original) The apparatus of claim 12 wherein the fifth code segment includes a sixth code segment for detecting the first data object within the table and comparing the path information to the query.

14. (Original) The apparatus of claim 11 wherein the first data object, the second data object, and the path information are stored in separate columns of a single row of the table.

15. (Original) The apparatus of claim 11 wherein the third code segment stores the path information as a data string listing the second node and the third node.

16. (Original) The apparatus of claim 11 wherein the third code segment stores the path information as a coded value generated from information about the second and third node and their locations within the directed graph.

17. (Currently Amended) A system comprising:

means for accessing path information comprising a sequence of nodes through ~~that describes a path through~~ a directed graph between a first node and a plurality of other nodes; and

means for responding to a query involving the first node, based on the path information.

18. (Original) The system of claim 17 wherein the means for accessing path information comprises means for storing the path information or a reference to the path information in a table containing a first data object corresponding to the first node.

19. (Original) The system of claim 17 wherein the means for responding to the query comprises means for directly locating the first data object within the table in response to the query.

20. (Currently Amended) The system of claim 19 wherein the means for responding to the query comprises means for performing a pattern match between the query and a data string listing the sequence of nodes ~~path through~~ the directed graph.

REMARKS

The above-identified application has been reviewed in light of the Office Action dated January 18, 2006. Claims 1 to 20 are in the application, of which claims 1, 11 and 17 are the independent claims. Claims 1, 7, 11, 17, and 20 have been amended herein. Reconsideration and further examination are respectfully requested.

In the Office Action, claims 1 to 3, 5 to 7, 9 to 13, 15 and 17 to 20 were rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 5,454,102 ("Tang"); claims 4 and 14 were rejected under 35 U.S.C. § 103(a) over Tang in view of U.S. Patent No. 6,006,233 ("Schultz"); and claims 8 and 16 were rejected under 35 U.S.C. § 103(a) over Tang in view of U.S. Patent No. 6,801,905 ("Andrei"). In response, independent claims 1, 11 and 17 have been amended to further clarify that the path information (or 'path') includes a *sequence of nodes*. Support for this newly clarified feature is found throughout the disclosure, including the paragraph beginning on line 11 of page 7 of the specification. Withdrawal of the rejections and further examination are therefore respectfully requested.

As embodied in the independent claims, the present invention generally relates to the storage of path information, in which path information including a sequence of nodes through a directed graph between a plurality of nodes, including a first node, is stored or accessed.

Referring to specific claim language, independent claim 1 recites a method, including storing data objects as nodes in a directed graph, and storing path information for a first object corresponding to a first node. The path information includes a sequence of nodes through the directed graph between the first node and a second node, where the second node is separated from the first node in the sequence of nodes by at least a third node.

Independent claim 11 recites an apparatus including a storage medium having instructions stored thereon, the instructions including a first code segment for storing data objects within a table, and a second code segment for storing a relation of a first data object to a second data object in the table, where the first data object and the second data object correspond to consecutive nodes on a directed graph. The apparatus also includes a third code segment for

storing path information associated with the first data object in the table, where the path information comprises a sequence of nodes within the directed graph that is between the first node, the second node, and a third node.

Independent claim 21 recites a system including means for accessing path information including a sequence of nodes through a directed graph between a first node and a plurality of other nodes, and means for responding to a query involving the first node, based on the path information.

The applied art is not seen to disclose, teach or suggest the features of the present invention. In particular, the applied art is not seen to disclose at least the features of *i)* storing path information (claims 1 and 11) or *ii)* accessing path information (claim 17), the path information including a *sequence of nodes* through a directed graph between a plurality of nodes, including a first node.

Tang is seen to describe a self-generating directed graph, which represents a structure and contents of structured data. *See* Tang, col. 3, ll. 45 to 50; Fig. 4; and Abstract. As shown in Figure 1, root node 1 is seen to include a list 11 of nodes contained in the root, as well as a data note building process. *See* Tang, col. 3, ll. 50 to 55. List node 20 is seen to contain a list 21 of the nodes contained in the list node, as well as process steps 22 for building additional list nodes, process steps 24 for building additional data nodes, and process steps 25 for querying structured data. *See* Tang, col. 4, ll. 4 to 10.

The Office Action alleges that column 4, lines 26 to 34 of Tang described the feature of path information providing relational information about a direct path. The cited portion of Tang, however, is merely seen to describe that data node 30 contains a pointer tag 31 to data in the structured data, where pointer tag 31 points to the location of data within the structured data. *See* Tang, col. 4, ll. 26 to 31. Nowhere is this cited text, however, seen to describe the storage of or access to a *sequence of nodes*, such as a sequence of nodes through a plurality of data nodes. Accordingly, Tang is not seen to disclose, teach or suggest at least the features of the independent claims, particularly the features of *i)* storing path information (claims 1 and 11) or

ii) accessing path information (claim 17), the path information including a *sequence of nodes* through a directed graph between a plurality of nodes, including a first node.

Based on the foregoing amendments and remarks, independent Claims 1, 11, and 17 are believed to be allowable over the applied reference. The other rejected claims in the application are each dependent from the independent claims and are believed to be allowable over the applied references for at least the same reasons. Because each dependent claim is deemed to pdefine additional aspects of the invention, however, the individual consideration of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, the entire application is believed to be in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience.

No fees are believed due at this time. Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

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